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IMPROVING AIR QUALITY - ERRATA

In the copy of the discussion paper you are receiving, some units of measurement used in the paper are incorrect due to a failure, not picked up in proof-reading, to translate correctly the original word-processing codes into the print format. The affected paragraphs are:

2.4 "10.0m" should read "10 microns" (or "10 μm")

5.25 "a limit value of 200kg/m^3" should read "a limit value of 200μg/m^3"
"hourly values of more than 200g/m^3" should read "hourly values of more than 200μg/m^3"

Section I

Introduction

1.1 Air quality has a continuous and pervasive impact on human well being and on our environment. As individuals, we have little opportunity to pick and choose the air we breathe, still less to contract out, and the invisibility of many of the most significant contemporary air pollutants only further emphasises our dependence.

1.2 Within the UK we are fortunate. We do not experience the problems of many of the cities in the developing world and some other industrialised nations. A long tradition of public health and environmental protection has served us well.

1.3 Nevertheless there remain problems, and new ones emerge. Those with respiratory illness know all too well the discomfort - and worse - that some air pollutants can bring. Evidence of possible links with asthma and other serious conditions for sensitive groups requires the most careful attention. And the cocktail of exhaust fumes and other pollutants can severely impair the quality of life in our urban environment.

1.4 In spite of the progress made in combatting air pollution in recent decades and the promise of significant reductions in many pollutants over the medium and long term, it is therefore the Government's view that early and effective action is required to improve air quality further. As a basis for this, a new and more comprehensive framework is required for the coordinated management of ambient air quality. The Government intends to publish its proposals later this year. Meanwhile this discussion paper draws out some of the key issues for public consultation and debate.

The Effects Based Approach

1.5 The basis for a more comprehensive framework for air quality management is already implicit in the key objectives and themes of the 1990 White Paper and subsequent yearly reports. The task now is to draw those themes and objectives together into a coherent structure. The Government believes that progress must be based on the further development of an effects-based approach, complemented by source-based controls. The essence of this approach is that the regulation and control regimes and strategies which aim to prevent specific emissions, by the introduction of cleaner technology or reduce them by pollution abatement or other technological means, while important, are unlikely to be sufficient on their own: it is important also to assess the impact of air pollution on human health and the environment, to set standards for specific pollutants in the light of this, and then to establish a comprehensive programme designed to secure those standards in the best way possible.

1.6 There are two fundamental reasons why the Government continues to consider that the further development of an effects-based approach is the most appropriate way forward for air pollution policy.

- It ensures that policy is focused on objectives rather than means - this enables development of innovative approaches such as market-based instruments; and
- It provides a basis for ensuring that policies are cost-effective and not disproportionate, and that environmental gains from regulatory controls can be properly quantified and judged.

1.7 An effects-based approach does not dispense with technology based controls. These remain essential. It simply provides an effective frame of reference by which they can be measured and judged.

Standards and Management

1.8 The essential requirements for an effects-based approach are an ability to set standards for ambient air quality which define satisfactory air quality and identify the impact of various levels of a contaminant; and secondly a framework of policies and procedures which allows air quality to be managed to secure those standards.

1.9 The Government believes that the UK is now in a position to move progressively towards the full operation of such an approach:

i) the Sustainable Development Strategy now points the way forward generally for environmental policy.

ii) we now have effectively in place the main policy instruments required for the improvement of air quality. Local Authorities have powers to regulate directly the domestic and some types of industrial emissions in their areas. Other industrial emission are controlled by national inspectorates. Significant progress has been achieved in reducing vehicle emissions; the Government is giving serious consideration to further tightening of vehicle standards.

The Government is also keen to explore the scope for the further use of economic instruments as a means to achieving its environmental objectives. Economic instruments, such as taxes, fiscal incentives or market-based trading systems, try to make environmental costs explicit and will often be more cost effective than detailed regulation.

iii) with the work of the Expert Panel on Air Quality Standards scientific advice is now becoming available on the impact of pollutants and the levels at which ambient air quality standards should therefore be set. A report on benzene was published early in February 1994, a second on ozone will follow shortly and reports on 1,3 butadiene, sulphur dioxide and carbon monoxide are expected later in the year;

iv) meanwhile the European Community proposes to introduce an Air Quality Management Framework Directive. This is likely to complement, at European level, the developments already under way in the UK;

Purpose and Structure of this Paper

1.10 This paper discusses the policies and procedures required for the setting, achievement and maintenance of air quality standards. In effect therefore it addresses for the first time the need for an overall framework for managing - and improving - the quality of our air.

1.11 The paper is in five sections. Section II discusses air quality in the UK, the problems which now need to be tackled, and the relevance of an effects-based approach to them. Section III outlines the Government's approach to air quality standards, what they should provide and how they should be set. Section IV assesses the range of policy instruments available for managing air quality and achieving air quality standards and sets out how the Government proposes to develop and use them. The final section discusses how the national policy framework might be complemented by more effective arrangements for local air quality management capable of tackling our remaining air quality problems.

Section II

Air Quality in the UK: An Overview

2.1 The UK has made great strides in the control of air pollution. Over the past few decades, the character of urban air quality has changed considerably. The Clean Air Act of 1956 and subsequent legislation have effectively solved the problems which arose from the consumption of coal in the domestic sector. Concentrations of smoke and sulphur dioxide, the pollutants responsible for the notorious London smogs, have been reduced by factors of five to ten since the 1960s. Similarly the work of Her Majesty's Inspectorate of Pollution (HMIP) and of Her Majesty's Industrial Pollution Inspectorate (HMIPI) in Scotland, together with the measures taken under Local Authority Air Pollution Control (the provisions of Part I of the Environmental Protection Act 1990) in conjunction with European Community legislation, have reduced, and will reduce further, the problems of air pollution from the industrial sector. At the same time, in response to rapidly increasing traffic activity and the pollution problems caused by vehicle emissions in most of our towns and cities, progressively more stringent vehicle emission standards have been adopted in the EC over the past two decades.

2.2 As a result of these measures, current levels of air pollutants in the UK generally meet such statutory ambient air quality standards as at present exist. The various types of standards are explained in greater detail in Section Three. The reductions in coal burning referred to above have eliminated breaches of the EC Directive on smoke and sulphur dioxide, which sets Limit Values (mandatory on Member States); the introduction of unleaded petrol together with the requirement for controls on certain industrial plant has eliminated the risk of exceeding the Limit Value for lead; and levels of NO_2 in large urban areas such as London approach the EC Limit Value but do not exceed it (apart from a technical breach in 1989, when the monitoring probe was fouled by NO_2 emitted directly from a vehicle servicing depot).

The modern challenge

2.3 Despite this considerable progress, there remain significant difficulties, both when air quality is assessed against such standards and guidelines as currently apply, and, more particularly, when it is judged against wider criteria and against recent research evidence on its effects.

2.4 **First, in some areas of the UK, even where there is no significant industrial activity, high levels of air pollution can occur,** although not necessarily entailing significant adverse health effects. In these areas, largely due to motor vehicle emissions, non-mandatory World Health Organisation (WHO) Guidelines are often exceeded, as to a lesser extent are non-mandatory EC Directive Guide Values. The pollutants of most concern in this regard are: ozone (O_3) where WHO guidelines are widely exceeded, particularly in Southern Britain; nitrogen dioxide (NO_2) for which the highest levels ever recorded in non-roadside locations were measured in 1991 and 1992; sulphur dioxide (SO_2); and carbon monoxide (CO). Attention is also turning to concentrations of fine particles which can enter the thoracic cavity. These are known as PM_{10} - defined as particulate matter of mass median aerodynamic diameter of 10.0m or less. A number of studies has now reported associations between particulate pollutants and effects on respiratory illness (including asthma) and mortality. Most of these studies have been carried out in the USA, but some similar results are beginning to emerge in Europe. In the UK very recent work has shown associations between respiratory diseases and smoke and SO_2 at concentrations below the non-mandatory guide values in the EC Directive on these pollutants. A sub-group of the Committee on Medical Effects of Air Pollutants (COMEAP) is currently reviewing this new work. In addition, although the *cause or causes* of asthma are still unclear, some air pollutants are known to exacerbate asthma in those with existing conditions. Further studies on the health effects of air pollutants are under way in the UK and other countries.

2.5 Alongside the scientific research on health effects, there has been a growing public perception over the last few years that, even if mandatory standards for air quality are adhered to, people who are exposed to polluted urban air suffer significant loss in amenity and quality of life. Although difficult to quantify, these effects are nonetheless real and deserve to be taken seriously.

2.6 **Second, there is the so-called 'cocktail effect'**. Most scientific investigation of the health effects of urban air pollution has so far concentrated on individual pollutants. There is however the possibility that combinations of pollutants may act synergistically, that is lead to effects in combination which would be more harmful than any which might be expected from the sum of the actions of each pollutant individually. Another advisory body to the Department of Health, the Advisory Group on the Medical Aspects of Air Pollution Episodes (MAAPE), is reviewing the combined effects of mixtures of pollutants for their next report. An equally important issue, and one for which there is some evidence, is that of air pollutants acting synergistically with other allergens in promoting asthma attacks or other allergic responses where the subject has been 'sensitized' by the pollutant so that the allergen effect is enhanced. Moreover, almost all the studies of air pollutants and health have concentrated on short term, acute effects. Very little is known at present about the effects of long term (months or years) exposures to non-carcinogenic air pollutants.

2.7 **Finally, in some urban areas industrial and infrastructure development can put air quality standards at risk.** A notable example is the East Thames Corridor which has recently been the subject of an air quality management study by HMIP. This area is already heavily urbanised, particularly on the eastern edges of the London conurbation, and contains a large number of major individual point sources of pollutant emissions. There was concern that imminent industrial development, bringing in significant new sources, would lead to the EC Air Quality Directive limit value for nitrogen dioxide being breached. The study's conclusion was that it was not likely that the limit value would be breached, but it emphasised that

> *An important issue in areas of urban and industrial development therefore is the need in the planning framework to consider all sources of pollutant emissions and to assess their respective future development in an integrated way.*

The Underlying Problems

2.8 These symptoms reflect a number of underlying problems:

(a) Industrial and domestic emissions still contribute to air pollution and can cause particular difficulty in some areas. But the most significant single feature of recent years has been the increase in the number of motor vehicles and the distance each travels. Vehicle use has doubled since 1980. In urban areas particularly, traffic is now the major source of many pollutants, including NO_x, particulates and, indirectly, ozone.

Improved technology means that total emissions of many pollutants are expected to decrease significantly over the next 10 years. **However, if traffic were to increase as forecast – on present projections it would double by 2025 – and if vehicle standards were not further improved, total emissions of many of the major pollutants would begin to rise again around 2012.**

(b) National policies and strategies will not necessarily resolve local problems. Technology may improve still further and national strategies should secure necessary reductions in overall emission levels. Even so, concentration of sources may mean that air quality in areas at risk does not improve. Indeed changes in the distribution of industry, of new housing and other developments, and of traffic may even worsen air quality in such areas and lead to the emergence of new problem areas.

(c) Management of air quality is fragmented. The Clean Air Act 1993 provides effective control for domestic emissions of smoke and SO_2. The framework for controlling industrial emissions of scheduled substances is also in place:

under the Environmental Protection Act 1990 standards are set for new industrial processes which belong to sectors prescribed for integrated pollution of local authority air pollution control, and existing processes in those sectors must be upgraded in accordance with a timetable in their authorisation from the national inspectorates (HMIP and HMIPI) or their local authority respectively. The emissions performance of road vehicles is also improving: all new petrol engined cars are now equipped with catalysts and small carbon canisters and tighter emission standards are being set for diesels.

Despite this, certain areas may still experience episodes of high pollution. Many factors will play a part, including weather conditions and local topography, but **the critical factor is the overall sum of emissions from different sources and their interaction, with each managed in a different framework.** Urban areas, where the concentration of sources is greatest, are most likely to be at risk. Even small 'hot-spots' may therefore affect many people.

(d) **The impact of air quality controls in an area may not be even-handed.** To take an example: in authorising an industrial process the regulators must set emission limits at levels which will not lead to breach of a statutory environmental quality standard. If a regulated business is located where traffic is growing as well, then without tighter controls on vehicle emissions, or measures to reduce traffic, the regulator might have to impose tighter limits on that business; this could place extra costs on the business in taking steps to meet the new limits. As the Sustainable Development Strategy makes clear, controls should be proportionate. The contribution which a sector makes should take into account the costs and benefits of measures to reduce emissions from other relevant sectors.

2.9 These problems inevitably raise the question whether air quality could be managed locally, to give a result that is more than the fortuitous sum of a large number of unrelated regulatory decisions and individual choices. Central to any management system will be effects-based standards which provide the key objectives towards which it aims.

Section III

Air Quality Standards

3.1 The Government is committed to securing, throughout the United Kingdom, good air quality based on a framework of exacting standards which takes full account of health and environmental effects. This requires a coherent and dynamic system of Air Quality Standards. This section therefore considers how this might best be achieved. Existing EC and WHO systems and their limitations are first described. The aims of, and requirements for, a more effective national system are then discussed. The section concludes by setting out a preferred approach, the progress made so far and how this may be built upon.

Current standards and their limitations

3.2 There are several sets of air quality standards or guidelines against which to assess air quality. At one extreme are the Limit Values in EC Directives, which are mandatory on Member States and have been incorporated into UK legislation. Such Limit Values exist for smoke and sulphur dioxide (SO_2) (80/779/EEC), lead in air (82/884/EEC) and nitrogen dioxide (NO_2) (85/203/EEC). The Directives for SO_2 and NO_2 also include Guide Values which, as the name implies, are not mandatory. They are set at more stringent concentrations than the Limit Values and are intended as guidance for the development of longer term policies for the reduction of ambient levels of pollution.

3.3 The World Health Organisation in 1987 published a series of air quality guidelines covering some 20 pollutants. WHO and their panels of expert advisers drew on the health effects literature current up to about 1985. The WHO guidelines were not intended to be taken up immediately as mandatory standards; rather they represented levels below which effects were unlikely to be found in the population at large, and in many cases included a safety factor to protect the most sensitive groups in the population. The WHO guidelines are therefore set at lower concentration levels than the mandatory Limit Values agreed within the EC.

3.4 WHO Guidelines for the various pollutants are given for different averaging times (that is for concentrations averaged over periods such as 10 minutes, one hour or a year) depending on the nature of the adverse effect. For example lead is a neurotoxin with potentially adverse effects on the nervous system from cumulative amounts in the body built up over long periods. The guideline for lead is accordingly expressed as an annual average, while for sulphur dioxide, which at sufficiently high levels can affect the respiratory tract very quickly, guidelines for periods as short as ten minutes are given.

3.5 A different form of threshold was incorporated into the most recent EC Directive on ozone (92/72/EEC). Instead of a mandatory Limit Value as in other Directives, the Ozone Directive specifies a concentration (expressed as an hourly average) above which the public should be informed. A higher level is also specified above which the public should be warned that adverse effects on health might occur. As well as complying with the requirements for Ozone, the United Kingdom's Air Quality Bulletin system provides information for Nitrogen dioxide and sulphur dioxide.

3.6 Nevertheless, in spite of valuable work by the European Community and WHO, there are grounds for doubt whether existing standards and guidelines will provide a coherent basis for understanding the effects of pollution, developing action to combat it, and guiding air quality management in Britain and Europe as we move into the 21st century.

* Mandatory standards exist for only a few pollutants. They have been set independently of each other, often with insufficient regard to the relative costs of achieving standards, and the reason for, or purpose of setting a standard at a particular level is not readily apparent. It is difficult therefore to infer whether exceedance of a standard for, say nitrogen dioxide, would be as important as exceedance of a standard for SO_2.

* WHO guidelines are more comprehensive. They are also all set at levels based on possible health effects. They are in the process of revision, and could in principle form a very useful component of air quality management strategies. However they would need to be suitable for incorporation in plans which take into account the broader issues involved in attaining targets based on such guidelines.

* Since existing standards for different pollutants are not easily comparable, they do not assist in setting priorities for different, or even conflicting air quality aims. Such conflicts need to be taken clearly into account in the standard setting process: for example, the introduction of catalytic converters on cars will reduce emissions of NO_x (and other pollutants), but could lead to increases in ozone concentrations in urban areas.

* There was relatively little research into the effects and management of urban air quality in the years following the success in many countries of strategies to reduce SO_2 and smoke from industrial and domestic sources. This has now changed; a great deal of new work is taking place. The new interest in ambient air quality is to be welcomed. But the resulting flow of information will not necessarily lead in the short term to a clearer view of priorities. Results can

conflict, or they may imply strategies for reductions in levels of one pollutant which would increase levels of another. Information must be drawn together and assessed critically.

3.7 Considerations such as these point, in the Government's view, to the need for a clearer framework within which a more coherent set of standards could be developed as a foundation for improving air quality in the UK.

A framework for Air Quality Standards

3.8 Any new system of environmental quality standards for air is unlikely to be effective and enduring unless there is clarity in the assumptions on which it is based and in the objectives to which it is directed. This section briefly reviews some of the key issues, and sets out the Departments' current thinking. These issues include: the relationship of such a system with technology controls; the nature of the legal obligations the system might carry; the relative weight to be attached to health and environmental considerations; and how, operationally, the success of any system is to be measured.

3.9 Harnessing technological improvement has always been seen as an important means of improving air quality. Indeed, it is sometimes argued that air quality policy should not focus on the achievement of particular standards in the atmosphere, but simply seek to harness technology to bear down on emissions until they are eliminated, or at least rendered harmless. Technological improvement is certainly a major route to securing improvements in air emissions, but it should be seen as complementary rather than as an alternative to an effects-based air quality standards system. The two traditions are linked in Part 1 of the Environment Protection Act 1990. A framework of environmental standards allows considerations of priority, costs and benefits, and proportionality to guide the exercise of regulatory controls. It can also define the circumstances in which pressing technological change encounters minimum or diminishing returns. On the other hand technological change will often be the major factor in making, where necessary, steady progress towards achieving standards in a flexible way which does not impose unreasonable constraints on economic activity.

3.10 The question of how far standards should have legal force has been answered in a number of different ways in environmental policy. In some cases standards have been seen purely as descriptive guidelines. In other cases they have been given legal force, with a clear obligation that they should not be breached and with sanctions attached to them. There may, however, be limited value in these approaches alone. The former provides little impetus for action, and the latter can impose an unnecessarily tight straightjacket when the factors influencing air quality may be wide ranging and the capacity to ensure a particular outcome

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limited. The better course may be to aim for a system of standards which can operate as an effective management tool. This system could help ensure, and if appropriate require, that in relevant circumstances appropriate action is put in hand to deliver the policy objectives to which the standards are geared.

3.11 Developing standards primarily as elements of a management tool does not mean that they cannot have statutory force, but careful thought must be given to the form that this should take. Since a wide range of extraneous factors, such as meteorological conditions, can determine whether a particular standard is in the end met, it is difficult to associate legal sanctions with the results. A more appropriate course may be to impose legal obligations on relevant authorities to take appropriate action over a particular timescale in pursuit of the agreed standard.

3.12 It may of course be the case that a particular plant or works is such a large emitter or 'gross polluter' that direct and swift action is appropriate to bring ambient air quality within the standard. On the other hand, where air quality targets are not being met it is more likely to be the result of a wide range of emissions, including traffic sources, and no breach of authorisations by industrial emitters may be involved. In these circumstances, legal sanctions on the emitters or the authority, would be inappropriate. However, a statutory system can quite reasonably impose a legal obligation on a regulatory body to exercise its functions so as to assist achievement of a standard, and that is already precedented in UK legislation. It is suggested therefore that the principal role of standards should be to provide a basis for *targets* for the work of regulatory bodies, backed if appropriate by an obligation on them to use their powers to promote remedial action if a target is not met.

3.13 On the appropriate basis for such standards the issues are more clear cut. They should be based primarily on health effects. Standards determined on such a basis can apply throughout the UK. They will need to be based on the best available scientific evidence and the balance of likely costs and benefits. Basing standards on health does not mean that effects on the natural environment would not be taken into account in considering air pollution. Where there are significant effects on the local environment and action is practicable, supplementary controls, informed by assessments of critical loads, can be brought into play alongside national health based standards, as the scientific basis for critical loads is developed. More stringent environmental standards could therefore be set for localities where ecosystems are particularly sensitive than those where the environment is less vulnerable. While this approach does not lend itself to general representation in a simple hierarchy of standards, it can complement rather than conflict with a general health-based model.

3.14 Finally, in considering any system of standards, particular regard must be paid to operational effectiveness. Any such system should be judged by three tests:

whether it helps set priorities; whether it balances costs and benefits; and whether it allows measurement of progress against the overall goals of pollution control.

3.15 A variety of approaches may be possible which would reflect these considerations, and the Departments will welcome suggestions during the consultative period. The Departments' present view however is that an effective system will need to be based upon three threshold levels for each pollutant, set following a careful appraisal of health, environmental and economic considerations. Although the framework would be the same, the thresholds would be at different levels for different pollutants.

- At an upper extreme an '*Alarm*' threshold would define the level above which there is a serious risk of widespread adverse health effects on a significant proportion of the population. Effects would not necessarily be confined to particularly sensitive groups, although these might be the first to demonstrate effects.

- The second threshold should identify that concentration of a pollutant which, on the balance of health and environmental benefits, costs and practicality reflects *long-term acceptability*. It defines an equilibrium point beyond which further action to reduce pollutant levels would not - given current circumstances and scientific knowledge - be sensible. Where on an effects curve such a threshold will lie will vary from one pollutant to another. For some pollutants, which have potentially serious effects on sensitive groups, it may be appropriate to set the threshold at or close to a 'no-effects' level. For certain types of carcinogenic substances, for which there is no known safe level, the appropriate course may be to set it at a 'minimum risk' level at which the risk of irreversible effects would remain but would be very low. For some other pollutants, however, where for example health impacts are slight but costs of abatement strategies relatively high, it may be appropriate to set the acceptability threshold significantly above a no-effects level.

- Finally, policy should be informed by a '*Background*' threshold. This would define the level of a pollutant which might be expected without man's activities. Such background levels might differ from place to place, depending on factors such as local geography, geology, vegetation and weather conditions, but indicative levels should be identified for reference.

3.16 The aim of developing a framework of this kind would be to provide the basis for a general strategy for managing air quality:

i) if alarm thresholds were approached or exceeded, emergency intervention measures should be taken. These could include widespread warnings to the public, together with action to reduce emissions quickly. Such actions, the costs of which could be high, would be justifiable only where it was clear that the benefits outweighed the costs. Clearly they could not be undertaken lightly. It should be stressed that with current pollution levels in the UK they should rarely, if ever, be needed.

ii) the core of a long term air pollution control strategy would be policies aimed at progressively reducing pollution levels to the acceptability threshold. There would be an obligation to put in place control strategies intended to achieve that objective. Where economically and technically feasible, the threshold would be the operational target of the strategy, with the period over which it was to be secured decided according to further consideration of costs and benefits. In cases, however, where the balance of costs and benefits was unclear, or the technical feasibility or effectiveness of control strategies uncertain, it might be appropriate to set operational targets above the threshold, with an obligation to review them in the light of experience.

iii) Except for highly dangerous substances, such as virulent toxins, the background threshold would not represent an operational target of policy. It would however act as a useful reference value, and in particular would help in judging 'no-effects' and 'minimum risk' levels and acceptability thresholds.

3.17 A framework of this kind for managing air quality would sit comfortably with the underlying philosophy of legislation on industrial emissions. Its most recent formulation is found in the Environmental Protection Act 1990. This requires that Best Available Techniques Not Entailing Excessive Cost (BATNEEC) are used for preventing releases, and where that is not practicable, for reducing and rendering harmless such releases. BATNEEC, and authorisations which set out the conditions under which individual industrial processes may operate, are subject to periodic review. Standards and procedures can therefore be adjusted in the light of changing environmental, economic and technical circumstance, and emissions progressively reduced where this proves desirable and feasible.

3.18 The Departments would welcome views on how far a framework of this kind would provide an effective basis for the longer term improvement of ambient air quality.

Setting Standards

3.19 Setting coherent standards for even the main pollutants of interest will be a challenging task.

3.20 Sound scientific advice is a necessary starting point. The Government has therefore already put in place a number of advisory groups to enable research findings to be absorbed and used to inform policy development. The various groups bring different types of expertise to bear on the complex issues involved and the programme of each informs those of the others. It is recognised, however, that the current state of scientific understanding of the effects of some of the pollutants involved is not such that unequivocal answers can be given and this is bound to constrain judgements on what should be done.

3.21 While standards can be derived based on the best scientific understanding of the causes and effects of pollution, such advice can also only be the starting point. A number of difficult issues must be faced. Most obviously, it will be necessary to decide how the extent and severity of effects are to be balanced against the cost of action, in determining the acceptability threshold and the timetable for moving towards threshold-based targets. Gains for some often mean losses for others, not only in financial terms but also in reduced convenience or quality of life. Such issues cannot be resolved by scientific or technical advice alone. They require wide consultation.

3.22 The Government is nevertheless determined that the difficulties inherent in setting standards for ambient air quality should be addressed. Action cannot be deferred until a problem breaches an 'alarm' threshold. The effects on health, the environment and the economy could be unacceptable. Although in the days of the notorious London smogs, levels would very clearly have been above the 'alarm' threshold and the effects were clear, at the lower levels of today, the adverse effects on health are still of concern. A number of studies in the last year or two, the majority of which were conducted in the USA and in other European countries, have indicated effects on health at pollutant levels which would not have been considered a problem ten years ago. An important concern over these effects is that while they might be weaker than those which led to so many excess deaths in the 1950s smogs, they may affect relatively large numbers of people.

3.23 Following the publication of the 1990 White Paper, the Government therefore set up a number of expert groups to provide advice on different aspects of air pollution. In the context of air quality standards, the most important of these is the Expert Panel on Air Quality Standards (EPAQS) which was set up by the Department of the Environment, with a joint secretariat from the DoE and the Department of Health, to recommend air quality standards to the Secretary of State for the Environment. EPAQS membership is made up of a medical and scientific experts in the field of air pollution health effects and air pollution science, and plays an important role in air quality policy in the UK.

3.24 EPAQS published its first report on benzene in February 1994. A report on ozone will follow shortly. Work is well advanced on other pollutants and reports on 1,3-Butadiene, carbon monoxide and sulphur dioxide should be published in 1994. During this period work will begin on particulate matter and nitrogen dioxide.

3.25 To assist in its work, EPAQS not only draws on the scientific literature, but also on the work of other advisory groups. The Department of the Environment's Quality of Urban Air Review Group (QUARG) was set up to advise the Department on the state of urban air quality, the sources of pollutants and their contribution to urban levels, future trends in emissions and air quality. QUARG published its first report summarising the state of UK urban air quality in January 1993, and its second report on petrol and diesel emissions in January 1994. The report concluded that, while diesels are superior to catalyst-equipped petrol cars in relation to carbon monoxide, hydrocarbons and the three greenhouse gases (carbon dioxide, methane and nitrous oxide) they have larger emissions of nitrogen oxides and far larger emissions of particulate matter and black smoke.

3.26 The Department of Health's Committee on the Medical Effects of Air Pollution (COMEAP) provides assessments of the effects of air pollutants on health. Sub-groups of COMEAP are currently addressing the issues of asthma and air pollution and the effects of particulate matter on human health. The latter topic is of particular concern in view of the increasing number of research papers, initially from the USA but more recently from Europe and also the UK, which demonstrate associations between levels of particulate material and human health effects, including mortality, often at levels below mandatory air quality standards. COMEAP is expected to report on particles around the end of 1994. The Committee has been asked to provide interim advice in the meantime.

3.27 The Department of Health's Advisory Group on the Medical Effects of Air Pollution Episodes was established in 1990 to consider whether or not health advice should be given to the public during periods of high pollution, and, if so, what this advice would be. The Group has produced reports on ozone, sulphur dioxide and particles, and recently on nitrogen dioxide. The Department of the Environment draws heavily on this advice in formulating the descriptors of air quality used in the daily Air Quality Bulletins (available on free telephone lines, CEEFAX/Teletext and through other media) and in producing advice on the possible health effects of pollutants.

3.28 The effect of air pollution on human health, in particular on respiratory health has also been identified as a priority topic for the new Institute for Environment and Health, recently established by the Medical Research Council in Leicester.

The Future

3.29 In summary, the preferred approach to setting standards is to adopt a framework which incorporates thresholds reflecting alarm and long-term acceptability levels. The setting of those thresholds will reflect the balance of costs and benefits and will be informed by the best available estimates of background and no-effects levels. The overall objective of policy should be to reduce progressively the ambient level for all pollutants towards an acceptability threshold. The timescales for achieving these levels will vary from one pollutant to another, but the overall goal should remain the same. The work of the Expert Panel on Air Quality standards and other advisory groups will be pressed vigorously forward in support of this approach.

3.30 While the Government's programme continues it is likely that the **European Commission** will propose a new programme for setting standards, and a framework for managing air quality to meet them, in the form of a Draft Air Quality Management Framework Directive. It remains to be seen what the scope of the Directive will be and what approach will be adopted for determining standards. The Government is keen to contribute to the development of a more coherent approach at European level; such an approach must avoid unnecessary regulation, have regard as far as possible for cost/benefit considerations and cost-effectiveness and be consistent with the principle of subsidiarity, in particular recognising that the *means* of achieving agreed air quality standards are a matter for the individual Member States.

3.31 The World Health Organisation is currently embarking on a revision of the air quality guidelines which it published in 1987. In concept, the revised guidelines will fulfil the same role as the previous set. As part of the revision, however, WHO intends to include a commentary on the consequences of exceeding the guidelines for individual pollutants. The EC have stated that the revised WHO guidelines will play an important role in the formulation of standards under the Air Quality Management Framework Directive. The Government intends that the work of EPAQS should make a helpful contribution to the work of WHO in the guideline revision, and in the formulation of standards within the EC.

3.32 The Government will, in the meantime, continue to lay the foundations for a standards-based strategy. EPAQS will make its second report and set of recommendations, on ozone, in April. The Panel has agreed to the Government's proposal that, in the light of growing concern, it should bring forward as a matter of priority its work on recommending appropriate ambient levels of particulates. The Government will announce in due course how it intends to take forward the recommendations of EPAQS, and will be considering what statutory changes might be necessary to achieve the policy objectives resolved upon.

Section IV
Meeting and Maintaining Air Quality Standards

4.1 Although air quality is good most of the time in most of the country, full achievement and maintenance of the type of standards discussed in the previous section cannot be achieved easily or over-night. Direct and indirect contributions from a variety of policies will be required. Central and local government and the new Environment Agencies (the Environment Agency for England and Wales and the Scottish Environment Protection Agency) will need to work closely together on a concerted basis. In local 'hotspots' a new coordinated and strategic approach may be needed.

4.2 This section reviews current policies and considers what more is required. In particular it:

- assesses the different tasks which compliance with a standards system may impose;
- examines the various policy instruments, already available or likely to be required, for these different tasks;
- invites discussion of how cost-effective achievements of standards could be assisted by carefully targeted and better coordinated arrangements for local air quality management in areas where air quality is particularly at risk.

The Tasks

4.3 Achieving air quality standards and thereafter maintaining compliance with them involves a number of distinct, but related tasks. The main task is to move progressively, and across the board, towards the 'long-term acceptability' threshold. Within this particular attention will need to be given to dealing with the 'hotspots' where air quality is at present particularly poor or may from time to time approach an 'alert' threshold. The third task will be to have a response mechanism in place which will cope with the inevitable occasions when infrastructure, industrial or other changes cause, or threaten, a significant deterioration in air quality.

4.4 The Departments believe that different sorts of policy instruments will need to be available if these different tasks are to be tackled effectively. Broadly speaking, the pattern should be as follows:

i) *National policies* will be required to reduce the overall level of a pollutant;

ii) *Supplementary local policies*, geared to local circumstances, will have a critical role in those areas where problems are particularly severe or conditions particular sensitive, and where national policies are therefore unlikely to be able to reduce pollution levels to meet standards over the timescale set in a sufficiently targeted and cost-effective way;

iii) once standards have been attained, it remains likely that occasional episodes of high pollution, or the risk of them, will from time to time arise. A *response mechanism*, sensitive to local circumstances, should therefore be available for use when required to tackle such problems.

4.5 These considerations point to the need for a variety of different types of environmental policy and regulation to underpin a standards based regime. In some cases national policies will be appropriate and sufficient. In others they will need to be supported by area-specific local action. In some cases it may be sufficient to rely on a single policy instrument. In other cases it may be more effective to look to the aggregate effect of a number of instruments in a local strategy. The Government considers that a variety of approaches, explicitly related to a standards system, need to be considered in determining the best overall approach to the management of air quality. The prospects for achieving air quality standards, and doing so at minimum cost, will certainly be enhanced by the variety of instruments available and the flexibility with which they can be employed. It is however at the interface of national policies with coordinated and strategic local action that the that a policy for improving urban air quality in the United Kingdom should particularly focus.

Pursuing Compliance: The Contribution of National Policies

4.6 The overall improvement of air quality through progressive reduction of pollutant levels towards acceptable thresholds must rely primarily on the contribution of concerted national policies, at least where targets are exacting and there are widespread exceedances. The statutory framework through which air quality is delivered is set at national level. In addition there are specific policy instruments which can only be applied sensibly at national level. Notable among these are economic instruments (such as taxes or fiscal incentives or market based trading systems) and technology controls. These can be supported by national policies with a less direct effect on air quality, such as planning guidance and transport policy.

4.7 The Government believes that economic instruments can progressively assume a more important role in achieving air quality standards. They tend to be less onerous than regulation and less expensive to operate, and can provide incentives as well as controls, in some ways more with the grain of individual behaviour. Partly as a result of established tax differentials to encourage the take-up of unleaded petrol, estimated lead emissions from petrol-engined road vehicles have already fallen from 8,000 tonnes to 2,000 tonnes in 1992. The Government's continued commitment to the increasing use of economic instruments, where appropriate, is now reflected in its intention that duty on road fuels should rise on average by at least 5% in real terms in future budgets. This step is being taken as part of the national programme to reduce CO_2 emissions in response to a commitment under the International Framework Convention on Climate Change, but should also reduce other vehicle emissions. Fuel duty differentials and taxation of externalities represent other areas where economic measures may be relevant to the achievement of air quality objectives. The Government will encourage debate on the scope for further use of economic instruments as part of a strategy to ensure that transport decisions reflect the costs they impose, including those reflected in air pollution.

4.8 Fixed emission limits are also normally set at national or international level - most notably, standard emission limits for vehicles. Because of their mobility there is no possibility of graduating or targeting the emissions in terms of their environmental effects. Air pollution from vehicles can also be regulated by specifying the composition of the fuel, and operating policies to ensure that vehicles are properly maintained.

4.9 Substantial progress has been made in recent years through a series of EC Directives, which has dealt with emissions from vehicles in three classes (passenger and commercial vehicles, and tractors). The latest of these are:

(a) Directive 91/441EEC (implemented in the UK by SI 1992 No 2137) which limits emissions of carbon monoxide (CO), hydrocarbons (HC) plus oxides of nitrogen (NOx), and Volatile Organic Compounds (VOCs) and particulates from new passenger cars and new light goods vehicles. In effect these limits have required the fitting of three-way catalytic converters since the end of 1992;

(b) Directive 91/542/EEC (SI 1992 No 2137) which limits emissions of CO, HC, Nox and (for the first time) particulates from new heavy duty (commercial) diesels;

(c) directive 93/59/EEC applies similar limits to new light commercial vehicles, or vans, as those applying to cars. The Directive is implemented in the UK by SO 1993 No 2201.

4.10 A further Directive, 92/55/EEC, lays down the requirements for vehicle emissions in roadworthiness tests, although this has yet to be implemented fully in the UK. The UK was, however, one of the first Member States to introduce in-service testing in advance of this Directive. In addition the sulphur content of diesel is regulated by Directives 87/219/EEC and 93/12/EEC (the latter to be implemented in the UK later this year) and the lead content of petrol by Directive 85/210/EEC.

4.11 Over the next few years there will be opportunities to go further, which the Government believes should be taken where practicable. Agreement is close on a new set of EC regulations which will require further significant reductions in emissions from cars and vans from 1997. Negotiations will soon be opening within the European Community on standards beyond 2000. EC proposals to extend emission controls to motorcycles and agricultural tractors are also under consideration. The Government welcomes the continuing efforts of the automotive industry to develop technology, which new emission standards can draw upon and encourage. The development of on-board diagnostics, allowing earlier recognition of emission problems, seems to offer many advantages in the longer term and the Government will be encouraging the EC to examine the potential of such technology.

4.12 It is not only with regard to vehicles that national policies and standards can provide the mechanism for progressive movement towards achievement of air quality standards. In the case of industrial emissions, there is a long history of the search for means of reducing pollution which take into account current technical knowledge about environmental effects, practicality, and economic factors. The principle that Best Practicable Means (BPM) should be used to prevent and then render harmless or inoffensive atmospheric emissions became central to the British system of industrial air pollution control in 1874. The Alkali, etc Works Regulation Act 1906 incorporated the concept and additionally set emission limits for certain cases. The Clean Air Acts built again on this foundation.

4.13 European legislation has also sought to encapsulate cost-benefit principles and the technological improvement in the definition of means to be used to combat emissions. EC Directive 84/360, the Air Framework Directive, made provision for establishing a prior approval system for a wide range of industries, based on the Best Available Technology Not Entailing Excessive Costs (BATNEEC).

4.14 The concept of BATNEEC was enshrined in the Environmental Protection Act 1990. In doing so, the Government recognised that process design and management techniques reduced usage of materials with high pollution potential, and use of alternatives could be at least as effective as reducing emissions by end-of-pipe technology. From an environmental point of view such strategies are often to be preferred and may result in reduced costs. The Act therefore adopted the wording 'Best Available *Techniques* Not Entailing Excessive Cost', which is defined as including technical means, design and technology, as well as matters such as training and supervision of staff and layout and maintenance of buildings in which processes are undertaken. It introduced two new systems employing this concept: the Local Authority Air Pollution

Control System (LAAPC), operated by local authorities, and the Integrated Pollution Control System (IPC) operated by HMIP and England and Wales and by HMIPI and the river purification authorities in Scotland.

4.15 A second important feature of these two systems is that, unlike controls on vehicle and domestic emissions, they are explicitly linked to air quality standards. The Act requires regulators to include in any authorisation they grant conditions aimed at achieving statutory air quality standards.

4.16 BATNEEC has been identified by sector working parties for each of the 77 industrial sectors subject to LAAPC, and is described in Secretary of State's Process Guidance Notes. For IPC, BATNEEC is set out in Chief Inspector's Guidance Notes. New processes are expected to implement BATNEEC standards immediately. Existing processes must upgrade according to a timetable in their authorisation from the appropriate regulator. In addition, both Guidance Notes and authorisations are subject to periodic review. The review process, taking into account environmental and economic factors as well as developments in techniques, can contribute to progressive achievement of air quality standards. In England and Wales authorisations have been issued to some 10,000 out of 13,000 installations subject to LAAPC. More than 5,000 installations will be subject to IPC.

4.17 Regulation will remain a key means for maintaining standards with respect to industrial emissions. But it should be proportionate and should not be used where other tools would be preferable. The Government intends to develop and introduce economic instruments where appropriate to improve industry's environmental performance. The guide 'Making Markets Work For the Environment', published in 1993, sets out this approach. The scope for voluntary agreements between the Government and industry sectors is being considered and some such schemes are already in operation. Companies are also being encouraged to adopt environmental management strategies with a view to continuous improvement of the environment over the medium and longer term.

Tackling 'Hotspots': Local Management

4.18 National Policies which harness economic instruments and technological change thus provide a basis for progressive movement towards the achievement of air quality standards. This is however only part of the task. There remains the complementary tasks of dealing with existing 'hotspots' and new developments which may locally put achievement of standards at risk. For these, national policies are unlikely alone to be sufficient: they must be balanced by local regulation and management. Even with good vehicle emission controls high levels of local traffic may cause local breaches of air quality standards. Equally, local concentrations of industrial and domestic sources can entail similar pressures. Pollution reduces the quality of life for those who live and work in our towns. Local communities will also be aware of the difficulty of attracting investment to areas where environmental quality is poor. This has costs for the local economy and encourages dispersed development, leading to further traffic growth, pollution and pressure on greenfield sites.

4.19 Local management is always critical in environmental protection, because of the variety - indeed uniqueness - of receiving environments. Air pollution effects on human health may be broadly consistent from one region to another, but effects on the natural environment generally are not. Environmental management must therefore be in part a local matter. There are also considerations of proportionality. If uniform national controls are carried too far they inevitably become wasteful and poorly targeted: either they will not be adequate for coping with the more extreme situations, or if they are, it will entail over-regulation and excessive cost elsewhere.

4.20 In considering local air quality problems it is important to note that other policies besides the direct control of emissions could be relevant. Effects may be indirect, as when in pursuing a primary function someone must have regard additionally for air quality considerations. 'Indirect' policy influences may be particularly relevant in local situations, since 'have regard for' obligations most typically arise in respect of local exercises of discretion. Equally, they are likely to be more relevant to the maintenance of a standard already achieved, which a large number of different policies or actions could jeopardise, than to strategies for the initial achievement of a target, where more direct effects are likely to be necessary.

4.21 Against this background, the rest of this section looks first at how policies determined at local level can be operated to help resolve local air quality problems which national policies may be unable to resolve in a cost-effective way. It looks in turn at point source emissions, transport and the planning system. It then considers the issue addressed more fully in the next section: the possible need for, and feasibility of local air management strategies, which might be introduced to tackle the problems of particular 'hotspots' and those of areas where infrastructure or industrial change threatens to put an air quality standard at risk.

4.22 *Domestic Emissions* Since 1956 the Smoke Control Area policy has provided an effective system for regulation of smoke, and ground level SO_2 emissions, from domestic sources in urban areas with high smoke concentrations. Discretion in the operation of the system is almost entirely in the hands of the local authority: the Secretary of State cannot prevent an area being declared, although he can require an authority to establish one if he judges it necessary and the authority refuses to act. On the whole the system has been highly effective; domestic emissions now represent a negligible problem to air quality in most cities.

4.23 *Industrial Emissions* Although the framework of technological controls, subject to BATNEEC, is set at national level, EPA90 provides for them to be applied locally on a basis of proportionality of environmental impact to economic cost. The Act also requires an authorisation to ensure that statutory air quality standards are not breached in areas affected by the emission. In principle, industrial controls are thus already sufficiently refined to help tackle the problems of areas at risk of failing to meet standards. The legislation provides important flexibility: not only must authorisations be reviewed at least every four years, they may be reviewed at any time. This leaves open the possibility not only of quickly requiring further abatement, but even, in extreme circumstances, of stopping part or all of a plant from operating. Where therefore a risk arises of infringement of an air quality standard the local authority, with the co-operation of the national inspectorate, could in theory review all relevant authorisations to ensure that any necessary overall reduction in emissions is even-handedly distributed. In practice, any action should, of course, be targeted and proportionate. But the framework for balancing contributions from different industrial processes is in place. What current systems do not provide, as the East Thames Corridor Study indicated, is any ready means of balancing contributions from industrial source sources with those from domestic and mobile sources.

4.24 *Transport* Road transport is the greatest single source of many pollutants, particularly in urban areas most likely to suffer incidents of high pollution. The Government is of the view that the transport sector must contribute to meeting environmental targets, including local air quality standards. The national legislation described above will ensure that emissions from road vehicles continue to decline for many years. But there may be occasions when vehicle emissions threaten the achievement of specific targets in specific locations. Measures to restrict traffic along certain routes in urban areas may then have a part to play.

4.25 The Government will also be providing guidance to local authorities on land use planning with the aim of facilitating greater use of public transport, cycling and walking, especially in urban areas (see para 4.24); and is looking for a complementary emphasis in the transport packages that local authorities are being asked to develop in bidding for funds for transport in their urban areas. Local authorities have increased freedom to implement traffic calming and traffic management schemes and to introduce lower speed limits in appropriate locations. The Government is looking into the potential of congestion charging in London. The Sustainable Development Strategy describes more fully the way in which the relationship between transport choices and effects on the environment is being explored.

4.26 The Government believes that it is timely to promote a better understanding of the way in which traffic management strategies and other local measures can affect local air quality. There is a wide range of issues and options, including:

i) local traffic management schemes are undertaken for a variety of social and environmental purposes, with safety often a paramount consideration. It is unlikely that particular traffic management schemes would ever be justified on air quality grounds alone, although some local authorities are already developing schemes with this as a key objective. Environmental effects are usually taken into account to a greater or lesser degree when assessing such schemes, but it is arguable that air quality considerations should be taken more explicitly into account when decisions are made. To do that a full understanding of the relationships and better predictive tools are likely to be needed.

ii) many towns and cities have pedestrianised or vehicle-restricted areas, often in the main shopping centres or historic core. If such restrictions are under consideration for other reasons, the effects on air quality both in the restricted area and in areas affected by diverted traffic should be taken into account in the final judgement;

iii) poorly maintained vehicles may be particularly prone to emitting high levels of pollution. These must be dealt with. The introduction of the MOT emissions test in November 1991 was a valuable step, and more is being done. For example, the Department of the Environment has already published advice on reporting smoky diesels, and smoke meters are now being used to measure emissions from lorries and public service vehicles at annual tests, and for measuring vehicles for the MOT test. One suggestion for further action is that local authorities with significant air quality problems should have powers to make spot checks on smoky vehicles and either ban them from entering areas at risk or take other enforcement action. The case for introducing any new powers would, however, need to be judged against the increased burden on resources;

iv) a particular problem is smoky diesel emissions from lorries and public service vehicles. They contribute significantly to the discolouring and soiling of buildings, estimated to cost £30m per annum in London alone. This problem should be tackled. The Government will be considering options in coming months but expects those directly responsible for public service and other vehicle fleets themselves to take steps to remedy the problems, and will consider carefully any proposals on how public policies could help resolve them.

4.27 *Planning* Planning and transport are interlinked. New developments influence traffic patterns. Improved transport infrastructure, allocation of existing road space and changes in services can lead to demand for new development. In preparing development plans local planning authorities are already required to have regard to the environmental impacts of their policies and to promote environmental improvement. Development control decisions should accord with plans unless material considerations indicate otherwise. There is national planning policy guidance on a number of subjects, ranging from conservation to economic development, which needs to be taken into account when preparing plans. Advice for England and Wales on planning and transport (PPG13) was issued in March 1994. The Department of the Environment recently published a Good Practice Guide to the Environmental Appraisal of Plans, which covered air quality issues among others. Certain types of major development are subject to environmental impact assessment.

4.28 The Government believes that this framework is adequate for consideration of air quality impacts. However, it recognises that closer attention may need to be paid to air quality in areas which are at risk of episodes of high pollution. One possibility would be to ask local authorities in such areas to assess the likely effects of the development plan against a model of air pollution in the area. Views are invited on this approach and on other ways in which planning decisions could form part of an integrated air quality management strategy.

4.29 The policies already in place, or under consideration in relation to domestic and industrial emissions, transport and planning, can therefore all play a part in targeted action to prevent or remedy breaches of air quality standards. The remaining question is how they can best be coordinated to ensure that necessary air quality improvements are secured in the most timely, efficient and cost effective way.

Section V

A New Framework for Local Air Quality Management

5.1 A wide range of instruments can be deployed, directly or indirectly, to tackle air pollution at local level. Tackling a local hotspot, will however often require a strategic approach which deploys the variety of different measures in a concerted way.

5.2 There are a number of reasons for this. Problems in a particular area may sometimes arise from one particular pollutant, but very often - and particularly in urban areas - the problems involve a variety of different pollutants requiring different sorts of remedial measures. While some pollutants come predominantly from motor vehicles, others derive from a variety of sources: in the case, for example, of Volatile Organic Compounds (VOCs), a pre-cursor of ozone, the wide range of sources include vehicle emissions, petrol vapour, industrial use of solvents, domestic use of solvents in such products as paints and aerosols and even natural sources such as trees.

5.3 The wide variety of sources also means that it is often difficult to track causation and apportion responsibility for breaches of standards. This points to a strategic approach dealing with all sources. Without it, excessive constraints may be imposed on that emission which, fortuitously, tips the scales into exceedance. Moreover, without a planned and strategic approach, it will be impossible to act equitably in ensuring that the different sectors - for instance industry and vehicles - bear a fair proportion of the remedial costs. Finally, and perhaps most importantly, it is only through a planned and coordinated approach, that the most cost effective means of securing a target can be identified.

5.4 Policies to achieve air quality standards in the UK are not at present under-pinned by coherent arrangements for local management of air quality, and there must be a doubt whether it will be possible to secure everywhere air quality improvements of the scale the Government believes is desirable, against clear targets and defined timescales, in the absence of such a framework. While it seems unlikely that new mechanisms will be needed in many areas, it must be expected that in some they will be essential.

5.5 There is relatively little experience of ambient air quality management in the UK. There are however some building blocks. One is the experience in recent years in operating national emission plans to achieve overall reductions at national level of particular pollutants. In 1990 the Government published a national plan for reductions of SO_2 and NOx emissions under the Large Combustion Plant Directive. Perhaps more relevant is the Government's recently published strategy for VOCs, which drew together a strategic plan for securing 30% reductions in aggregate VOC emissions from a very wide range of industrial, vehicle and domestic sources. These plans provide a precedent for how air quality targets can be achieved through coordinated action on a wide variety of fronts.

5.6 There is also useful experience elsewhere in the world which can be taken into account. In **Germany** a new law, to come into effect in 1995, sets federal limits for ambient levels of NOx, benzene and soot. When those limits are exceeded local authorities are obliged to consider imposing constraints on vehicle traffic, subject to specific criteria. Smog abatement regulations have been introduced in **The Netherlands**, again to be enforced by local authorities. During episodes of high pollution the authorities can impose restrictions on emissions from businesses and must inform the population. Plans must be in place at each level of national and local government to secure and protect air quality standards. **Switzerland,** however, has perhaps the most comprehensive framework for local action on air pollution. Federal law imposes maximum emission levels and impact thresholds for air pollutants, with compulsory air monitoring and severe penalties for non-compliance. The Swiss cantons are empowered to enact their own regulations, and most have produced a clean air strategy. These strategies incorporate many detailed practical measures including, for example, mandatory reduction of the sulphur content in diesel and heating fuels and a number of traffic management measures.

5.7 Within the United Kingdom itself, there is one helpful, although limited, precedent: the machinery introduced in 1956 to deal with the urban smogs of the 50s and 60s. Recognising that coordinated local action was necessary, the Clean Air Acts introduced the concept of Smoke Control Areas, which imposed supplementary controls in areas of particular risk to bear down on smoke emissions. This policy has now largely achieved its purposes. Its tasks were narrower and simpler than those involved now in tackling urban air pollution, which are likely to involve a wider range of pollutants, and both fixed and mobile sources. Nevertheless a sensible first step may be to draw upon some of the key elements of the Smoke Control Area mechanisms, and building upon their success. What would be similar would be a targeted area-specific approach, which made available to an authority within that area a range of supplementary controls geared to achieve a particular air pollution abatement target. What would be different would be that there would be a wider range of problems than purely smoke and SO_2 to tackle; that a wider range of policy instruments, covering fixed and mobile sources, transport and planning, would be relevant; and that the regulatory interest would go wider than purely the local authorities.

5.8 An elaboration of the system of Smoke Control Areas already in place is unlikely to bear the weight of the additional complexity – in terms of range of pollutants and types of policy instrument needed – which contemporary air quality problems involve. Never theless, taken with relevant continental experience and the considerations raised earlier in this paper, it is possible to identify many of the key elements which could usefully find a place in local air quality management. These might include:

- an emissions inventory and air quality model, together with enhanced monitoring;
- existing smoke control area powers;
- a coordinated review programme for industrial emissions in the area or critically affecting it;
- local planning and highway authorities to have specific regard for the impact of planning and transportation proposals on air quality;
- the use of traffic regulation orders to restrict vehicle access and movement;
- specially targeted measures to enforce controls on smoky vehicles within defined limits;
- public information service – making available information on pollution conditions at a more disaggregated level than current national arrangements.

5.9 As well as the policy instruments which might be used, it will be important to look carefully at the organisational arrangements and processes throught which they are brought together. There are three key issues:

- are techniques available to identify and assess areas at risk?
- what would be the area of operation and relevant authority or authorities for a strategy?
- how should the strategy development and management process operate?

The rest of this section outlines these issues.

Identifying and assessing areas at risk

5.10 The essential tools for identifying areas at risk are monitoring, compilation of emissions inventories and air pollution modelling. The Departments' view is that these are all now sufficiently developed to provide a basis for local air quality management where needed.

5.11 The Department of the Environment carries out national monitoring for a number of purposes, most notably to develop policies and assess their effectiveness. The scope and effectiveness of the system is regularly reviewed, and will be reviewed again in the context of introduction of the new air quality standards. It is, however, neither feasible nor necessary to carry out continuous automatic monitoring of all pollutants throughout the UK. Careful targeting must be the basis of policy: it would, for example, be reasonable for priorities to include special monitoring of heavy metals in the vicinity of industrial sources such as metal smelters. A considerable amount of information is already available to assist in the identification of problematic areas. As well as the existing automatic monitoring in the Government-funded networks, the Inspectorates carry out monitoring and inventory compilation in pursuit of their regulatory responsibilities. An increasing number of local authorities also undertake automatic monitoring both in pursuit of their regulatory responsibilities and to take a wider view of the local environment. A consultation paper, seeking views on proposals for the better integration of this monitoring with Government's activities, was published in November 1993. Non-automatic monitoring can provide a valuable supplement to the continuous automatic data. For example, a large national monitoring survey, in collaboration with local authorities and using diffusion tubes at some 1300 sites, has been under way for the past two years. Data from this substantial monitoring activity, together with the existing level of knowledge on emissions across the UK, can be used together with models to identify priority areas for more detailed study and the development of air quality management strategies.

5.12 The Department of the Environment will also continue to develop methodologies for compiling emission inventories. It already maintains a national inventory of air pollution sources and the species and quantity of pollutants which they produce. More detailed inventories will be needed in order to support local air management. Development of such inventories for the main urban areas in the UK will be encouraged. An inventory has already been completed for London. A similar exercise in is hand for Birmingham.

5.13 The third indispensable tool, air pollution modelling, is an established technique which is becoming more widely available. The Department of the Environment will continue to promote the development of modelling relevant to the main issues covered in this paper. It is not inclined to promote at this stage the development of a single national model. It may, however, be appropriate to encourage the development of a quality assurance or other service to provide advice on the suitability of various models for different purposes. Views on these questions would be welcomed.

5.14 Recently, a number of air-quality management studies have brought together the various techniques. For instance, the Northern Ireland Environment Service have sponsored a study in which a detailed emissions inventory was combined with modelling to help plan compliance with the Smoke/SO_2 Directive in Belfast. In

Lincoln a dispersion modelling study looked at the relative contributions of power stations and urban sources to SO_2 concentrations in Lincoln. The stimulus was concern over possible damage to Lincoln Cathedral. The conclusion was that SO_2 levels should decrease in line with UK total emissions - and, so long as this was the case, a local air quality management strategy would not be needed. The most recent study of London air quality involved the development of a detailed London emissions inventory in collaboration with the London Energy Study. In this case the inventory has been coupled to an interactive modelling tool which will allow different management options to be assessed and compared with different air-quality objectives. It could thus not only identify a need for action, but would be integral to the response.

5.15 A very recent example of a model playing a central role in an air quality management assessment is afforded by the study of the East Thames Corridor carried out by HMIP. This arose from concern that, given the existing level of industrial activity and the extent of traffic emissions, planned industrial developments might result in concentrations of NO_2 in the region exceeding the limit value in the relevant EC Directive. A detailed modelling study of all the major point sources in the area was undertaken, and estimates made of the effects on air quality of possible increases in traffic activity. The conclusions of the study were that within the assumptions of traffic growth in the area the planned industrial developments were not likely to result in breaches of the mandatory EC limit value. Nonetheless, under certain conditions the EC Guide Values may have been exceeded and this finding led to additional controls being imposed on a major emitter in the area.

5.16 It is probable that local authorities will normally wish to carry out monitoring and related activity where they perceive that difficulties may occur. The Departments do not consider that all local authorities should have a statutory duty to carry out monitoring. This would be wasteful of resources where air quality is not at risk. The Departments are concerned, however, to ensure that action should be taken where necessary and that resources should not be wasted by duplication of effort.

5.17 Following the consultation paper on integrating local authority monitoring with national monitoring issued in 1993, a further document will be issued shortly, taking forward the proposals in that paper. The Departments would welcome views in response to this paper on whether inventory compilation and air pollution modelling should be similarly coordinated, the possible contribution of the relevant environment agencies and local authorities, and how best to ensure that, while unnecessary monitoring is not undertaken, a sufficient level of monitoring is undertaken in those areas where air quality may be at risk.

Local air quality management

5.18 Air does not, of course, respect town, district, county or national boundaries, and a complicating factor is that different pollutants behave differently. For ozone, a pollutant which may reach high levels hundreds of miles from the emissions of volatile organic compounds and NOx which gave rise to it, strategic management over a wide area would be necessary. Other pollutants, including those controlled primarily because of odour, may travel only short distances. It would, in principle, be possible to devise for each pollutant a different strategy, operating over a different sized area and managed by a different agent. But, as has already been made clear, difficulties with different pollutants will often appear together, particularly if they are due to one type of source, or to associated source types. Furthermore, possible strategies for dealing with one pollutant can affect levels of another. It would be wasteful and counter-productive to put in place competing simultaneous strategies. It will be necessary therefore to reach a view on the scale at which arrangements for coordinated management of air quality might best operate. A key requirement will be to derive a system which both ensures that standards are met throughout the UK, and retains sufficient flexibility for different approaches to be adopted to suit local circumstances.

5.19 This links with the key question of the responsible authority and how the contribution of a variety of bodies are best harmonised. When the instruments which would need to be co-managed in an integrated air quality management strategy are considered, it is clear that most are already the responsibility of local government. In addition to direct responsibility for smoke control and local industrial air pollution control, local authorities are responsible for indirect instruments such as development plans and transport plans. These do not have the short term impact on air quality that emission controls can provide, but they will be essential to long-term sustainable strategies for air management, even though they must of course balance the different needs of their area as a whole and cannot be directed towards single specific targets. While there might be relatively little difficulty in a local authority operating emission controls to meet the overall requirements of a management plan led by another body, the importance of indirect instruments points clearly to a key rôle for local government.

5.20 Similar considerations apply with respect to implementation. It is, of course, often the case that measures are implemented by a body other than that which prepared and approved them. But the measures under discussion here are such that responsibility for the key elements of implementation must, in the Departments' view, remain with local authorities.

5.21 In some cases, however, sensible air quality management arrangements will not fit local authority boundaries. There will need to be scope for coordinating action where a number of contiguous authorities are making long term strategies. In England and Wales, the Environment Agency could have an important rôle to play. As a pollution control authority it will, of course, work closely with local authorities. But it is arguable that it should have a wider remit. Local authorities, in developing air quality management strategies, will require support and advice on environmental matters, particularly where technical issues are involved. The Department of the Environment would not wish to constrain local authorities in seeking such support. But it may be appropriate for the Environment Agency to be consulted as a matter of course. The Agency will work throughout England and Wales, with a similar body established in Scotland. It will not be restricted by local authority boundaries. Its advice might therefore be of particular value if air quality problems extend over several contiguous authorities.

5.22 In Scotland, the Scottish Environment Protection Agency will assume the local air pollution control powers under the Environment Protection Act 1990 which are currently exercised by the District and Islands Councils. It will therefore be important for it to liaise very closely with any local authorities in Scotland preparing an Air Quality Management Strategy. The Agency will, moreover, be able to ensure a consistent contribution to such strategies so far as industrial emissions are concerned and to provide advice based on its monitoring of air pollution across Scotland. From 1996 the creation of unitary authorities following the reorganisation of local government will facilitate the kind of integrated approach which effective Air Quality Management Strategies demand.

5.23 In Northern Ireland legislation and the functional and operational roles of regulatory and enforcement bodies do not always precisely match those of either England and Wales or Scotland, and different arrangements would therefore be necessary there.

5.24 The possibility of effects across local authority boundaries from areas which do not themselves require an air quality management strategy should also be borne in mind. National Inspectorates and local authorities should already consider such effects when authorising industrial installations under Part 1 of the Environmental Protection Act 1990. Similar questions may arise, however, where new roads or other non-industrial development is planned. Views would be welcome on how coordination could best be achieved in cases where a long-term strategy needs to be developed to cover an area extending beyond one authority's boundary, or to take account of occasional transboundary effects.

5.25 As improved arrangements for the local management of air quality are developed it will be important to consider their relationship to measures to reduce the incidence and severity of major pollution episodes, of such kind as the 'winter smog' which occurred in London in December 1991. In general, the reduction of air pollution from vehicle and industrial sources will reduce the risk of such episodes of high pollution and avoid substantially the need for sudden intervention. It will not, however, eliminate risks completely. Current standards already recognise this. For example, the EC NO_2 Directive sets a limit value of $200kg/m^3$, expressed as the 98th percentile of hourly averages over a period of one year. This means that hourly values of more than $200g/m^3$ may be reached without a breach of the directive, provided they are relatively infrequent. Although a period of high pollution may not breach a standard, if a significant episode is likely to occur appropriate action will be necessary. The likely effectiveness and costs of such action will need careful consideration. The Environmental Protection Act 1990 allows special operating conditions to be set for industry when pollution is likely to be high. Such conditions have been imposed, but the Department of the Environment does not anticipate their widespread use. Nor, at the present time, does it consider that substantial traffic bans would be justified, but this will be kept under review. The causes and effects of high pollution are under continuing review and research continues into strategies for optimal, cost-effective methods of reducing concentrations during such periods.

The Planning and Management Process

5.26 The number of areas requiring air quality management strategies may be few, but they are likely to be diverse. Arguably, the aim should therefore be to devise the least prescriptive framework consistent with the priority of meeting standards throughout the UK. It may be appropriate,therefore, to consider an approach based on the following:

A local authority with significant air quality problems should consider designating an Air Quality Management Area, within which an air quality management strategy for one or more pollutants would operate. The local authority should, after consultation with relevant bodies, prepare an Air Quality Management Strategy for the area, covering such matters as are relevant. It should consult the Environment Agency/Scottish Environment Protection Agency and a range of local interests;

Where, as will often be the case, a problem extends beyond one authority's boundary, local authorities should consider acting together to devise a single strategy. The mechanism for coordination would preferably be through national or regional guidance, rather than through a rigidly specified structure. Again, the Environment Agency/Scottish Environment Protection Agency should be consulted.

It should be possible to secure effective strategic arrangements under existing legislation, by informal consultation, and that would be a sensible first step while experience is gained. If experience subsequently showed them to be necessary, consideration could be given to suitable legislative changes. Views are invited on the adequacy of existing powers and on how the respective contributions of local authorities, the proposed environment agencies and other relevant bodies might most effectively be linked.

5.27 The costs of new arrangements of this kind would need to be carefully considered. In principle, the direct costs to central and local Government in public expenditure should not be significant. Local management strategies should not involve the exercise of new functions, so much as exercising those functions in a different and more coordinated way. To the extent that such operations are not already coordinated, there is at present a significant element of regulatory friction, which is unproductive and must carry its own cost penalty.

5.28 The development of local management strategies will rely on an improved technical base, but expenditures in this area are already significant. Central Government expenditure on monitoring has doubled in the last three years to some £4m, and some further rise is planned. When taken with existing monitoring by local authorities and other regulatory bodies, some limited extension may be required in some areas, but there are gains and economies to be secured from clearer objectives and better targeting. Most of the technical skills are already available for a further development of emission inventories and modelling, but, to the extent necessary, the Government will adjust its own research and monitoring capabilities to meet the need for further development.

5.29 To the extent that there are wider resource costs to industry and the community at large from new air quality standards and targets, these will need to be subject to careful cost-benefit appraisal. There are already substantial costs from low level air pollution in terms of health services, impediments to economic efficiency, the cleaning of buildings and the environment, and in the perception of the attractiveness of British cities internationally as places to live and do business. More effective co-ordination will make clear how far the burden of meeting the costs of higher air quality standards is at present efficiently apportioned between industry, transport and the community at large. Rigorous cost-benefit analysis will need to be applied in assessing alternative future strategis. However, as the Prime Minister emphasised in his Foreword to the Sustainable Development Strategy, we also need to be sensitive to the intangibles that cannot be reduced to scientific imperatives and the narrow language of economics.

Next Steps

5.30 The framework described above represents only one possibility, which it is hoped can provide the basis for identifying the options available in different parts of the UK. The Government would welcome views on all the issues raised in this paper, including suggestions for alternative approaches, before it reaches conclusions on the framework to be put in place.

5.31 Meanwhile the Department of the Environment proposes to consider a number of experiments with local authorities to test approaches to air quality management. To this end, it will welcome proposals from authorities wishing to set up integrated local air quality management strategies in their area. Proposals from groups of authorities would be particularly welcome.

5.32 Later this year the Government will publish its conclusions on the issues raised in this paper, and set out the steps which it intends to take to implement them. The Government recognises that its proposals will have to take into account not only the UK's own needs, but also the terms of the expected EC Directive on Ambient Air Quality Management Framework. Discussions on the Directive are expected to begin later this year. If primary legislation is required, the Government will seek an early opportunity to introduce it following agreement of the Directive.

5.33 Comments on the arrangements for England should be sent to Mr Michael Taylor, Department of the Environment, Rm B350, Romney House, 43 Marsham Street, London SW1P 3PY (tel: 071 276 8477 or 8324 fax: 071 276 8299) **by 13 June 1994**. Further copies of this paper can also be obtained from this address.

Comments relating to Scotland should be sent to Mr Jim Murray, Scottish Office Environment Department, Rm 229, 83 Princes Street, Edinburgh EH1 2ER (tel: 031 529 8657 fax: 031 529 8666)

Comments relating to Wales should be sent to Mr Gerry Quarrell, Welsh Office, Environment Division, Cathays Park, Cardiff CF1 3NQ (tel: 0222 823180 fax: 0222 823658)

Comments relating to Northern Ireland should be sent to Mr Roger Lightbody, Department of the Environment for Northern Ireland, Environment Protection Legislation, Lancashire House, 5 Linenhall Street, Belfast (tel: 0232 310763 fax: 0232 310696)

5.34 Ministers are sometimes asked to release details of respondents' views. All those commenting are therefore asked to make it clear in their response:

(a) whether they propose to publish their comments or make them available to the media: and

(b) whether they agree that the Departments may make copies of their responses available in the libraries of both Houses of Parliament and place copies in the Library to which the response is sent.

5.35 Unless it is made clear that the response is intended for publication or library access, it will be treated as in confidence to the Government, but may be counted in any numerical survey which does not identify individuals' responses.

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